

## Albrighton FWS Flood Alleviation

**A**lbrighton, Shropshire has historically suffered flooding, with significant events occurring in 2002, 2004 and 2006 when an exceptional (1 in 150 year) storm caused numerous property floodings. Severn Trent, and its consultants Grontmij, undertook feasibility work which identified flooding mechanisms far greater and more complicated than originally thought, including river flooding, highway drainage inadequacies and lack of hydraulic capacity in the public sewerage system.



*The Deliberate Curve in the 1800mm diameter tunnel at Albrighton*

*Courtesy of Barhale Construction plc*

Grontmij's feasibility report recommended the provision of stormwater storage, and identified underground services as an exceptional risk. The report considered a shaft tank but rejected this due to construction difficulties (rock blasting in village centre), available location, lack of an emergency overflow route and the risk of significant flooding in the event of back-to-back storms, with the flooding transferred from residential areas to the village centre. An open-cut scheme to lay upsized sewers was also developed but service congestion, the cost and complexity of diversions (£900K with a lead time of 9 months) and traffic disruption along the two main thoroughfares led STW to consider trenchless solutions, minimising the negative impact on Albrighton's economy. The preferred solution required 876m of 1200mm and 600mm diameter microtunnels and 600m of smaller diameter sewers laid in open-cut.

However, the proposed tunnel diameter meant that drives of only 100m could be accommodated, necessitating the provision of 8 chambers/manholes and construction spanning two Christmas shopping periods. Furthermore, STW ran the risk of not delivering the benefits during AMP4, with potential fines. Indicative proposals

for the 1200mm diameter tunnelling scheme suggested that there were significant risks to delivery, mainly associated with the tunnelling operations (ground conditions) and shafts (service diversions). Consequently, the team revisited the design with the aim of further reducing costs and risks for STW.

The adopted solution included 1800mm/600mm diameter microtunnel and 450mm/600mm sewer laid in open-cut. The larger diameter tunnel enabled the designers to increase the drive-length and omit two shafts/manholes, but with reduced clearance between the microtunnel and existing sewers, retained as part of the design. The remaining manholes were specifically designed to eliminate any impact on buried services. The solution introduced an innovative proposal: to incorporate a horizontal curve on the line of the new pipe moving it away from the old sewers, reducing risk of damage. It is believed that this is the first time the technique has been used in the UK.

Although the geology at preferred pipe horizon comprised rock of varying hardness, geological faults bisected the tunnel location. This

resulted in variable ground conditions ranging from extremely hard sandstone to softer mudstones. Extra boreholes were commissioned to provide sufficient knowledge to determine the most appropriate excavation techniques and to identify the fault locations enabling the impact of differing ground either side of the excavations to be reduced. Barhale proposed the use of a Herrenknecht unit for the larger tunnel and an Iseki Super Mole for the 600mm bore, both being mixed ground machines capable of dealing with the expected conditions. Issues were apparent in sourcing the machines, given the world demand for such units, but extensive evaluation of the programme indicated that if construction work commenced in August 2008, the Christmas embargo (a Council ban on any work within the highway over the six week trading period) could be accommodated. STW subsequently issued a letter of intent to Barhale to secure both tunnelling machines and an early involvement instruction to commence construction of the main launch shaft in advance of the contract being signed. This shaft was subsequently used to verify rock composition enabling the machines to arrive with the most appropriate cutters fitted.

Given the location of the work, which affected the village centre and associated access routes, customer care has taken a very high priority. Prior to construction work starting, extensive public consultation and liaison took place, supplemented by frequent letter drops informing residents and businesses about major scheme developments/progress.

A Severn Trent staffed customer drop-in centre was set up in the village during construction to enable residents to raise issues directly, thereby enabling prompt resolution. Regular meetings and presentations were also held with bodies as diverse as the Local Trader's Association and Rotary Club, not only to advise on progress and business compensation issues but also to outline the nature of the construction work itself. This approach has proved extremely successful with business compensation claims running at a low level and very few letters of complaint having been received. These complaints were outnumbered by letters of praise.

Severn Trent have made a contribution towards the production of a traders' leaflet promoting the advantages of shopping in the village, as well as making a donation towards the running costs of the "Parish Flyer" a local charity bus service aimed at providing elderly residents with a means of transport. Barhale sponsored the village's 2008 Christmas lights.

Despite the challenging nature and location of this scheme, the collaborative approach adopted has resulted in the scheme being delivered with cost-certainty for the client and with all risks adequately mitigated. The works are ahead of programme, with tunnelling activities completed; there have also been no lost-time injuries. Public perceptions are extremely positive due to the high emphasis placed on customer care, and resulted in a party being thrown by the Parish Council to thank the project team for their diligent work.

The project programming has resulted in every public commitment having been honoured, including construction commencement and duration, and meeting the Council-imposed Christmas embargo.

Both Barhale and Severn Trent adopt a zero-accident culture and this has been evident throughout the scheme with considerable attention focused on the fine-detail to ensure that all risks are mitigated if not eliminated. From the tunnelling perspective, the machines chosen minimised the need for personnel access into the tunnel, with the 'driver' located in the remote control cabin. Although the geology was known to vary considerably, in consultation with the designer, additional boreholes were sunk to more accurately determine the geology and thereby give a better indication of wear rates. This meant that changing of cutters could be minimized with replacement taking place at pre-planned locations where the rock formation was stronger.



*The Deliberate Curve*

*Courtesy of Barhale Construction plc*



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From the public perspective, viewing panels have been provided within the hoardings to allow residents to observe the ongoing work in a controlled manner. In addition, a programme of School visits has been undertaken to highlight the dangers of children playing on construction sites. To date, there have been no incidents involving members of the public and no reportable accidents or lost-time injuries.

The level of planning is further evidenced by the provision of a short temporary access road across wasteland for the local fire brigade. This prevents a 4-mile detour during some of the major road closures with the associated benefit to public safety.

Albrighton is a small market town with narrow streets. The adoption of trenchless techniques avoided the disruption, noise, dust and substantial traffic management issues associated with open-cut pipelaying.

Barhale worked hard to re-use as much of the excavation arisings as possible, with dried tunnel slurry being recycled as landfill capping, and harder sandstone, sands and tarmac used as pipe-bedding material. This avoided expensive and environmentally-unfriendly transport and special waste-tipping charges.

The team worked hard to mitigate the effects of the works on the town. Barhale made it a matter of policy to utilise local transport and equipment/materials suppliers wherever possible. Furthermore, working hours were restricted to dayshifts only with no work carried out on Sundays.

Considerable emphasis has been placed on ensuring compliance with legislative requirements. Given the extensive road closure and traffic management requirements, the team decided that the best way of

dealing with the issue would be to hire in the expertise. Consequently, under a novel agreement, a Shropshire County Council Highway Inspector was engaged for the duration of the construction period to provide advice on and co-ordination of the traffic issues. This has ensured that the road closure and noticing programme has been synchronised with construction resulting in no over-runs or TMA non-compliances.

Close attention has been paid to compliance with CDM and environmental legislation with regular site audits being carried out by the Contractor's, the Client's and external auditors.

#### Project Summary

Scheme:	Albrighton FWS Flood Alleviation Scheme, Shropshire
Client:	Severn Trent Water
Designer:	Grontmij
Contractor:	Barhale Construction plc
Value:	£6.5M
Conditions:	ICE 7th Edition (Amended)
Duration:	June 2008 - September 2009
Project Content:	274m of 1800 mm diameter tunnel 602m of 600 mm diameter tunnel 11 no Manholes and Shafts 305m of existing 225mm sewer upsized to 600mm in open cut. 140m of existing 225mm sewer upsized to 450mm in open cut.

**Note: The editor and publishers wish to thank Severn Trent Water Ltd, Barhale Construction plc and Grontmij Ltd for preparing the above article. ■**



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## Award winning infrastructure solutions

Grontmij's award winning infrastructure team designs integrated solutions that deliver long term benefits to the community. Along with contractors, Barhale, we were recently awarded two awards for the featured project at Albrighton, Shropshire:

- Corporate Responsibility award in the Community from our client, Severn Trent Water
- UK Society for Trenchless Technology Award for new installation of a large project

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